

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 17-21 are pending in the present application, with Claim 17 amended and Claim 19 cancelled by the present amendment.

In the outstanding Office Actions, Claims 17-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Niwa (U.S. Patent No. 6,475,606) in view of Bogdanski et al. (U.S. Patent No. 6,150,636, hereinafter Bogdanski) or Soma et al. (U.S. Patent No. 5,231,690, hereinafter Soma).

Claim 17 is amended to recite the features of cancelled Claim 19. No new matter is added.

Applicants acknowledge with appreciation the personal interview between the Examiner and Applicants' representative on January 22, 2004. During the interview, various features of the claimed inventions were contrast with the cited references, with an emphasis placed on the claimed "outermost circumference of the at least one resistance heating element area [being] within 35 mm from an outside edge of the ceramic substrate."

Briefly recapitulating, Claim 17 is directed to a ceramic heater, comprising a ceramic substrate, the substrate comprising one of a carbide ceramic and a nitride ceramic, and having a thickness of less than or equal to 25 mm. The ceramic heater also includes at least one resistance heating element area including a resistance heating element formed on a first surface of the ceramic substrate. A heating face of the ceramic substrate is located on a second surface of the ceramic substrate that is opposite to the first surface. An outermost circumference of the at least one resistance heating element area is within 35 mm from an outside edge of the ceramic substrate.

Because a resistance heating element area is within 35 mm from the edge of the ceramic substrate, it is not necessary to form an insulating ring. Thus, the reduction of the peripheral temperature of the ceramic substrate 11 can be prevented even if the ceramic substrate is fixed with a supporting case 51 shown in Figure 3 through a supporting pillar 56 in which the ceramic substrate is held while being in non-contact with the supporting case 51. Therefore, the structure is simplified.¹ In addition, the temperature difference in the heating face can be reduced, and the generation of cracks caused by a rapid increase and decrease in temperature can be prevented. Moreover, because the thickness of the ceramic substrate is 25 mm or less, heating and cooling of the substrate can rapidly proceed. As shown in Examples 1-10 of the specification, when the distance between the outer circumference of the resistance heating element area and the outer circumference of the ceramic substrate is 0.5 to 35 mm, the temperature difference in the heating face is as small as 2°C to 4°C, and a crack is not generated even with a rapid temperature rise. Further, the temperature reduction time is as short as two minutes. This is because a cooling fluid is brought into direct contact with the resistance heating element.

Niwa discloses a ceramic heater including a ceramic substrate and a resistance heating element. The heating element is preferably formed *in* the substrate but may be formed *on* a lower surface of the ceramic heater.² The ceramic substrate may be a nitride ceramic.³ The resistance element may be formed from a sintered metal or a conductive ceramic material such as carbide ceramic.⁴ The ceramic substrate is preferably less than 25 mm.⁵ The diameter of the ceramic board is preferably not less than 200 mm.⁶ However, Niwa does not disclose or suggest a substrate comprising a carbide ceramic. Furthermore, Niwa does not

¹ Specification, page 2, line 46 – page 3, line 8.

² Niwa, column 6, lines 25-30.

³ Niwa, column 3, lines 64-67.

⁴ Niwa, column 6, lines 30-40.

⁵ Niwa, column 3, lines 28-41.

⁶ Niwa, column 3, lines 49-56.

disclose or suggest any diameter of the resistance heating element, let alone a resistance heating element having “an outermost circumference...within 35 mm from an outside edge of the ceramic substrate.”

Bogdanski discloses a cooking system including a contact heat-transferring electric hotplate made of a non-oxidic ceramic, particularly silicon nitride.⁷ The ceramic has an average thickness of 2-5 mm.⁸ As noted during the above-mentioned interview, the figures of Bogdanski show that the outer circumference of the heating element(s) are close to the edge of the ceramic. However, like Niwa, Bogdanski does not disclose or suggest any diameter of the resistance heating element, let alone a resistance heating element having “an outermost circumference...within 35 mm from an outside edge of the ceramic substrate.” Instead of controlling edge temperatures by restricting the diameter of the heating element, Bogdanski relies on heating elements 37 located in an edge portion of the ceramic.

Soma discloses a wafer heater that includes a discoidal substrate made of a dense ceramic and a resistance heating element buried in the substrate. While Soma recites that the heating element is buried over the entire discoidal substrate,⁹ close inspection of the figures of Soma show that the diameter of the heating element is less than the diameter of the substrate.¹⁰ However, like Niwa and Bogdanski, Soma does not disclose or suggest any diameter of the resistance heating element, let alone a resistance heating element having “an outermost circumference...within 35 mm from an outside edge of the ceramic substrate.” Furthermore, Soma exclusively discloses that the heating element is buried *in* the substrate, whereas the heating element of the claimed invention is *on* the ceramic. Applicants submit that even if Soma did disclose Applicants’ claimed 35 mm feature, this would not cure the

⁷ Bogdanski, column 2, lines 19-20.

⁸ Bogdanski, column 3, lines 2-3.

⁹ Soma, column 6, lines 10-12.

¹⁰ Soma, Figures 3A-3B.

deficiencies of the Niwa embodiment corresponding to Applicants' invention (i.e., the embodiment

Applicants therefore submit this rejection does not meet the burden of proving unpatentability as none of the cited prior art, individually or in combination, disclose or suggest all the elements of either the previously pending or currently pending independent Claim 17. Applicants submit that the Examiner's suggestion that the Figures of Bogdanski and Soma show that a heating element having a diameter that is "close" to a ceramic substrate diameter does not rise to a teaching of Applicants' claimed invention. Applicants submit that this interpretation is an impermissible hindsight reconstruction of Applicants' claimed invention. Therefore, Applicants submit the inventions defined by Claim 17, and all claims depending therefrom, are not rendered obvious by the asserted prior art for at least the reasons stated above.¹¹

Furthermore, Applicants submit there is no teaching, suggestion, or motivation, either explicitly or implicitly, in either reference to combine the ceramic of Niwa with the cooking element of Bogdanski or the wafer heater of Soma to arrive at Applicants' inventions recited in Claim 17. First, Applicants note that Niwa explicitly teaches curling associated with temperature rise and fall is mitigated by the introduction of silicon into the ceramic to inhibit Young's modulus,¹² and not due to any heating element diameter or thickness. In fact, Niwa goes to great length to establish minimum ceramic thicknesses and diameters because devices with greater ceramic thicknesses and diameters to not prone to curling.¹³ Thus, Applicants suggest there is no motivation within Niwa to consider any improvements regarding the relative diameters of the ceramic substrate and the resistance heating element. Furthermore,

¹¹ MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaack, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

¹² Niwa, column 10, lines 28-33.

¹³ Niwa, column 3, lines 40-55.

regarding Bogdanski, Applicants first note that this reference is directed to the art of cooking devices, which is not analogous to Applicants' and Niwa's art of semiconductor production heaters. At least for this reason, Applicants submit that the combination of Niwa and Bogdanski is improper. Also, Applicants submit that Soma's disclosure of an embedded heating element and Soma's corresponding failure to disclose or suggest a resistance heating element *on* the ceramic makes the combination of Soma and Niwa improper since the heat gradient characteristics of a ceramic with an embedded heating element is different from the heat gradient characteristics of a ceramic with a non-embedded heating element. Thus, for each of these reasons, Applicants submit it is only through an impermissible hindsight reconstruction of Applicants' invention that the rejection of Claim 17 can be understood.¹⁴

Accordingly, in view of the present amendment and in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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¹⁴ MPEP § 2143.01 "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge of one of ordinary skill in the art."